Development of an operational drought risk management system for the Chilean Drylands

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Abstract

Climate variability is characteristic for arid zones in Latin America, influencing dryland management and causing climate uncertainty and vulnerability for water users, especially those sectors that depend on annual rainfall (e.g., rainfed agriculture, multipurpose reservoir operations). Therefore, a case study was initiated in Central Chile to develop the building blocks of a climate risk management system, focusing primarily on climatic, hydrological and agricultural drought. Up till now, operational tools were developed that predict climatic conditions one season ahead, based on a successful statistical downscaling of a GCM (Climate Forecast System) onto 48 rainfall stations in the region. This was then further expanded through a non-Homogeneous Markov Model (nHMM) to allow generating probabilistic forecasts of daily rainfall characteristics, that are most relevant for agricultural drought prediction (f.e. using the Water Requirement Satisfaction Index). A similar approach was used to produce seasonal forecasts of discharge, which was coupled to the operational procedure of a multipurpose reservoir in the region and produced a set of probabilistic scenarios which were evaluated by the water users in order to take a decision on water allocation. An additional drought assessment product was developed, named Drought Atlas (http://www.cazalac.org/atlas_sequias_gm.html), that looks at drought recurrence intervals based on robust regionalization statistics using L-moments. This sheds light on drought in a spatially distributed way, identifying zones of higher drought risk potential. Finally, ongoing applied research focuses on the identification of drought risk in a near term climate change setting, creating stochastic decadal climate simulations to assess its probable impact on climatic, hydrological and agricultural drought in the region. As such, a climate risk management system is emerging, that could potentially be replicated in other dryland areas of Latin America.